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Remarks

Applicants and their undersigned representative thank Examiner Trinh for the detailed explanations in the final Office Action dated March 12, 2007. The claims have been amended to recite printing a *solution* (for example, the solution may further include *soluble* nanoparticles) in a pattern, and curing the printed pattern to form an array of patterned semiconductor film lines having stated width, length, and thickness dimensions. Although the cited references disclose printing silane inks in general terms, they do not disclose or suggest printing a solution in a pattern and curing the pattern to form such an array of lines, as defined in Claim 41.

The primary reference (Shiho et al., U.S. Pat. Appl. Publ. No. 2003/0045632 [hereinafter "Shiho"]) is concerned with making coatings for solar cells. As a result, it provides no motivation to one of ordinary skill in the art to print a solution in a pattern and cure the printed pattern to form an array of lines having the recited dimensions. The secondary references (Jacobson et al., U.S. Pat. No. 6,294,401 [hereinafter "Jacobson"], Kim, U.S. Pat. No. 6,355,198 [hereinafter "Kim"], and Tani, U.S. Pat. No. 5,254,439 [hereinafter "Tani"]) fail to cure this deficiency of the primary reference. Consequently, the present claims are considered patentable over the cited references.

Restriction Response

The restriction requirement is respectfully traversed. Of the claims added in the previous amendment (Claims 96-164) the Examiner has withdrawn Claims 96-110, 113-124, 126-134 and 139-159 from consideration, as being directed to a non-elected invention. However, the withdrawn claims are merely dependent claims which add further limitations. For instance, claim 96 depends on active claim 43, and recites that said passivated semiconductor nanoparticles comprise "silicon nanoparticles and a passivation layer thereon."

MPEP 806.05(c)(II) states:

> "Where the relationship between the claims is such that the separately claimed subcombination B(sp) constitutes the essential distinguishing

> feature of the combination AB(sp) as claimed, the inventions are not distinct and a requirement for restriction must not be made..."

In this case, the restricted claims depend directly or indirectly from independent Claim 41. Thus, the restricted dependent claims represent a combination of independent Claim 41 (the claimed subcombination) with one or more further limitations (or further "features"). As a result, the claimed subcombination (independent Claim 41) defines the essential distinguishing feature of the present invention. Accordingly, restriction is not be proper, and should be withdrawn.

In effect, the new (constructive) Restriction Requirement in the final Office Action of March 12, 2007 adds an effective election of species requirement to the carlier Restriction Requirement, which election of species requirement was never made in the earlier Restriction Requirement. The withdrawn claims should be rejoined and examined with the active claims in this case.

The Rejection of Claims 41-46, 56-61, 62-65, 111-112, 125, 160-164 under 35 U.S.C. § 103(a)

The rejection of Claims 41-46, 56-61, 62-65, 111-112, 125 and 160-164 under 35 U.S.C. § 103(a) as being unpatentable over Shiho taken with Kim and further in view of Jacobson is respectfully traversed.

Shiho discloses a silane composition for preparing a semiconductor thin film of a solar cell. The silane composition contains a polysilane compound represented by the formula Si_nR_m (n is an integer of 3 or more, m is an integer of n to (2n+2) and R is independently a hydrogen atom, alkyl group, phenyl group or halogen atom, with the proviso that when all of the R's are hydrogen atoms and m = 2n, n is an integer of 7 or more), and at least one silane compound selected from cyclopentasilane, cyclohexasilane and silylcyclopentasilane (Abstract). The silane composition of Shiho is believed to further contain insoluble silicon particles (component (C);

see paragraphs [0058]-[0064]: "silicon particles are dispersed ... whereby ... the film does not crack or peel off." [0064]).

Shiho teaches that a silicon film can be made by forming a coating film of the first or second silane composition on the substrate and then treating it with heat and/or light in a non-oxidizing atmosphere (see paragraphs [0105]-[0106]). Shiho also teaches that the coating film can be treated with light to convert it into a silicon film or silicon oxide film, and that a silicon film or silicon oxide film having a desired pattern can also be formed ***by exposing part of the coating film selectively using a photomask*** having a desired pattern (see paragraph [0127]). Shiho further teaches that the conductive film and insulating film may be formed and patterned before use, in which case they may be patterned by a general method such as masking or lithography, or by an ink jet method (see paragraph [0153]).

However, Shiho is silent with regard to the length and width dimensions of lines formed in such a pattern, since Shiho is concerned with making coatings for solar cells (see, e.g., paragraphs [0128]-[0152] of Shiho). This is especially significant with respect to the claims as presented, since the claimed printing step and the resulting pattern is greatly aided by the use of a solution. For example, it is believed that a dispersion of finely-divided silicon (e.g., the silicon particles of Shiho) cannot be reliably and/or reproducibly printed onto a substrate. (Note that claim 42 has been cancelled since unpassivated semiconductor nanoparticles, as such and as encompassed by the disclosure of Shiho, are generally not soluble.)

Therefore, Shiho does not disclose or suggest a method that forms a patterned semiconductor film comprising an array of lines having a width of from 100 nm to 100 μm and a length of from 1 μm to 5000 μm by curing/irradiating a silane-containing solution printed by inkjet printing, gravure printing, offset lithography, or flexographic printing, as recited in the present Claim 41. Consequently, Shiho is deficient with regard to the present claims.

Kim fails to cure the deficiencies of Shiho. For instance, Kim does not appear to cure a composition by irradiating the corresponding printed pattern. Instead, Kim appears to disclose curing by use of chemical reactions (e.g. col. 33, ll. 48 - 60). Consequently, Kim cannot suggest

the advantages for printing technology gained by irradiating a pattern formed from a printed ***solution***, as recited in the present claims.

Jacobson does not cure the deficiencies of Shiho and Kim, because Jacobson also fails to suggest how certain compositions can be cured by irradiating a solution printed in a pattern.

Jacobson discloses nanoparticles that are utilized to create, through deposition and patterning, functional electronic, electromechanical, and mechanical systems (Abstract, ll. 1-3). Monodisperse or polydisperse nanoparticles can form stable colloids or suspensions (not solutions, as claimed) in appropriate dispersing media. As a result, printing technology can be utilized to deposit and pattern nanoparticles for mass production or for personal desktop manufacturing (Abstract of Jacobson, last 7 lines).

Jacobson discloses that electromagnetic radiation, such as from a heat lamp or laser, may be used to *thermally* convert certain nanoparticles to their bulk state (col. 6, ll. 32-35), but Jacobson is silent with regard to irradiation of silane compounds, such as those of the formulas (1) and (2) in the present Claim 41. Also, like Shiho, Jacobson is silent with regard to the widths and lengths of lines in any printed and/or cured pattern. As a result, Jacobson does not cure the deficiencies of Shiho with regard to curing/irradiating a patterned semiconductor film comprising an array of lines having a width of from 100 nm to 100 μm and a length of from 1 μm to 5000 μm, formed by inkjet printing, gravure printing, offset lithography, or flexographic printing a (doped) silane-containing solution, as recited in the present Claim 41.

Consequently, no possible combination of Shiho, Jacobson and Kim can disclose or suggest irradiating or curing a patterned semiconductor film comprising an array of lines having a width of from 100 nm to 100 μm and a length of from 1 μm to 5000 μm, formed by inkjet printing, gravure printing, offset lithography, or flexographic printing a (doped) silane-containing solution, as recited in the present Claim 41. Therefore, this ground of rejection is unsustainable, and should be withdrawn.

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The Rejection of Claims 51, 53-54 under 35 U.S.C. § 103(a)

The rejection of Claims 51-54 under 35 U.S.C. § 103(a) as being unpatentable over Shiho, Kim and Jacobson, further in view of Tani, is respectfully traversed.

As discussed above, the combination of Shiho, Jacobson and Kim is deficient with regard to irradiating or curing a patterned semiconductor film comprising an array of lines having a width of from 100 nm to 100 μm and a length of from 1 μm to 5000 μm, formed by inkjet printing, gravure printing, offset lithography, or flexographic printing a (doped) silane-containing solution, as recited in the present Claim 41. Tani fails to cure the deficiencies of Shiho, Jacobson, and Kim.

Tani discloses a polymer having linear --Si--O--Si-- bonds and --Si--Si--Si-- bonds, or polysilane bonds that are greater than trisilane bonds, sensitive to far ultraviolet rays (Abstract, ll. 1-4). The polymer undergoes oxidation with oxygen plasma to form SiO_2 that is resistant to oxygen dry etching, exhibits absorption peaks only in the far ultraviolet, and is suitable for preparing a single layered resist or an upper resist of a two-layered system (Abstract, last 5 lines). Tani also discloses a *rotary-coated* upper resist layer 3, selectively irradiated with pulses of KrF excimer laser rays 4 (248 nm) through a mask carrying a desired pattern (see col. 6, ll. 11-21, and FIG. 2(c) of Tani). Then, the exposed portions of the layer 3 were developed with ethanol to remove the same and to thus form a positive working upper resist pattern 3a (see col. 6, ll. 21-24, and FIG. 2(d) of Tani).

However, Tani appears to be silent with regard to printing. As a result, like Shiho, Jacobson and Bulthaup, Tani is necessarily silent with regard the widths and lengths of lines in any printed, cured, irradiated pattern, as well as the printing advantages gained by use of the solution recited in the present Claim 41. Also, Tani does not appear to disclose *cyclic* Group IVA compounds of the formulas (1) or (2), particularly in which the substituents bound to the Group IVA atoms are predominantly H (e.g., the present formula (2)) or exclusively H (e.g., the present formula (1)).

Consequently, no possible combination of Shiho, Jacobson, Kim and Tani can disclose or suggest irradiating or curing a patterned semiconductor film comprising an array of lines having a width of from 100 nm to 100 μm and a length of from 1 μm to 5000 μm, formed by inkjet printing, gravure printing, offset lithography, or flexographic printing a (doped) silane-containing solution, as recited in the present Claim 41. Therefore, this ground of rejection is unsustainable, and should be withdrawn.

The Rejection of Claims 135-138 under 35 U.S.C. § 103(a)

The rejection of Claims 135-138 under 35 U.S.C. § 103(a) as being unpatentable over Shiho, Kim and Jacobson, and further in view of Korgel is respectfully traversed.

Korgel is cited merely for disclosing nanoparticles having an average diameter of about 5 nm, 3.5 nm, or 2 nm. However, the reference does not cure the deficiencies of the combination of Shiho, Kim and Jacobson with respect to irradiating or curing a patterned semiconductor film comprising an array of lines having a width of from 100 nm to 100 μm and a length of from 1 μm to 5000 μm, formed by inkjet printing, gravure printing, offset lithography, or flexographic printing a (doped) silane-containing solution. Accordingly, this ground of rejection should be withdrawn on the same basis as claim 41.

Conclusions

In view of the above amendments and remarks, all bases for objection and rejection are overcome, and the application is in condition for allowance. Early notice to that effect is earnestly requested.

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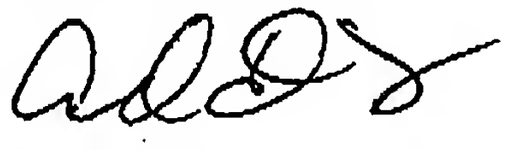
If it is deemed helpful or beneficial to the efficient prosecution of the present application, the Examiner is invited to contact Applicant's undersigned representative by telephone.

Respectfully submitted,



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